Notebook, N-93-07-24

This notebook covers the period July-December 1893. It was used by Arthur E. Kennelly and an unidentified experimenter as a rough record book in the Galvanometer Room. The book contains notes, drawings, tables, and calculations regarding physiological experiments on the anesthetic and analgesic properties of electrical currents. There are also entries relating to cathetometer and meter readings and to tests of wire, a receiver for the phonoplex telegraph, a "noiseless" motor for an automatic piano, and the magnetic properties of various chemical solutions. Transcriptions of some of this material can be found in Arthur E. Kennelly Notebook #7. The pages are unnumbered, and one page has been removed from the back of the book. Approximately 140 pages have been used. A one-page note from Edwin W. Hammer to Kennelly, dated January 6, 1893, has been inserted into the book.

Meter for Aust. Prime C°

0.042" 0.055" × 3 = 0.165 + 0.020 = 0.185"

0.055" × 4 = 0.220 + 0.020 = 0.240"

12 wire × 6 = 72 turns all round

72 × 7 = 504' × 0.0058"

= .295" ÷ 4 = 0.074

Pl = 3.1 × 0.15 = 1.55 × 4 = 6.20

0.016" = 0.04

$\frac{0.05}{6.20}$ = 0.0133

Mmf $\frac{300}{0.0133}$ = 30000

Pl cur = 3000 × 72 = 216000 per amp

$\frac{6.2 \,|\, 216000 \,|\, 35}{27\,60}$

34000 cm-gm

$\frac{70}{360}$ $\frac{280}{500}$

34 cm-gm per [illegible]

The present motor with magnet in cam contains 525g with 6.1 amp at rad of 1.45 cm ~~77.8~~ $\frac{725}{36}$ 7.61 cm-gm = 12.5 cm-gm per amp.

$30000 \times \frac{1}{10} \times 140 = \frac{420000}{27} = 70$

Polar bore 1.658 0.027

Iron 1.628"

0.022

1.598"

1.600

Gross 0.240" × 0.190"

12

0.055

0.0062

72

434

4466

36

374

7.136

.503

.165

20. 22¾ commenced application
.29¾ apparent anaesthesia
.31 slight anaesthesia in
the finger & little in
the other surface of hand
21.00 pm also slightly in wrist
.30 stopped
Sensation returned almost immediately

8.26.0 Dr Olmsted

.42.0 slight anaesthesia over wrist
and end of hand
45.0 no paraesthesia no loss of
sensibility

.54.0 Dr Peterson recommended
2 mos
.57.0 anaesthesia distinct

21.07¼ Commenced with Dr Peterson
45.0 14.0 N pr sec about 3 mos

.14.0 No anaesthesia no paraesthesia
ceased application

.17.0 Commenced on Dr Peterson with
small alternator
¼ 200 r/pm

.19 Anaesthesia also tingling slight
in hand & fingers
palmar aspect of wrist
also anaesthetic

31. 21.20 11.00 pm placed apparatus in hand
22 very faint anaesthesia
.23.0 slight anaesthesia
.24½ temp sense not affected
.25 turned on full speed
perfect anaesthesia pain at max
partial anaesthesia. distinct
.26½ scarcely felt the warmth
of a lamp
.27.0 almost complete anaesthesia
complete restoration on reversing

21.30/4 hard copies sent to be
finished and bound
[illegible]
1.12/6 corrections in proofs
arrived 31.12.1/pm 4.

Cassiopeia 5-15 29th July 93

0	241.8	2	255.30	4	275.50	6	293.30	8	311.50
.1	2.62		9.14		6.37		4.11		2.49
.2	3.24		8.99		7.24		5.02		3.34
.3	4.24		50.83		8.11		5.92		4.30
.4	5.08		1.68		8.99		6.84		5.10
.5	5.90		2.52		0.85		7.75		6.00
.6	6.78		3.37		50.72		8.66		6.94
.7	7.54		4.21		1.59		9.57		7.90
.8	8.36		5.05		2.46		50.48		8.70
.9	9.18		5.90		3.33		1.39		9.60
1.0	250.00	3	266.75	5	284.20	7	302.30	9	320.5
.1	0.83		7.62		5.10		3.22		1.4
.2	1.66		8.50		6.00		4.14		2.3
.3	2.44		9.37		6.90		5.06		3.2
.4	3.32		10.25		7.80		5.99		4.1
.5	4.15		1.12		8.70		6.90		5.0
.6	4.98		2.00		9.60		7.82		5.9
.7	5.81		2.87		10.50		8.74		6.8
.8	6.64		3.75		1.40		9.66		7.7
.9	7.47		4.62		2.30		10.58		8.6
2.0	258.30	4	275.50	6	293.30	8	311.50	10	329.50

10	329.50	12	346.50	14	361.75	15.0	367.25		
	30.37		7.32		2.30	14	361.75	8.5	
	1.25		8.15		2.85	13	354.75	7.0	
	2.12		8.97		3.40	12	346.50	8.5	
	3.00		9.80		3.95	11	338.25	8.25	
	3.87		10.62		4.50	10	329.50	8.25	
	4.75		1.45		5.05	9	320.5	9.00	
	5.62		2.27		5.60	8	11.50	9.00	
	6.50		3.10		6.15	7	02.30	9.30	
	7.37		3.92		6.70	6	93.20	9.10	
11	338.25	13	354.75	15.0	367.25	5	84.20	9.0	
	9.07		5.65			4	75.50	8.70	
	9.90		6.15			3	66.75	8.75	
	40.72		6.95			2	58.30	8.45	
	1.55		7.50			1	50.0	8.30	
	2.37		8.25			0	241.8	8.2	
	3.20		8.95						
	4.02		9.65						
	4.85		60.35						
	5.67		1.05						
12	346.50	14	361.75						

Outside [illegible] from 3rd motor
15th July 93

85 bell passages in 1 min 4 cells 2.677
" " " 40.5 turns per passage

Regular for motor

light 4 cells	2.1	2.2	68 bell passages
light 3	2.0	1.7	51
bell 3	2.9	1.5	30.25

Over

light 3 cells	1.80	2.1	64
	2.70	1.7	38
	[illegible] 2.6	without bell	

6 file motor	2.00	1.7	10.5
	3.0	1.7	7.3

64.5 bells to one bell passage

another	2.5	1.7	10.25
			6.9
	3.8		8.7

15 15.5 / 19 8.7

5.7 / 6.0 / 5

[illegible] July

30.16 Dr Edwards commenced two fingers in hot water

Spent 1400 ohms [illegible] on anaesthesia

28.17 Low [illegible]

.19½ 1500 [illegible] sensation slightly dim

.21 [illegible] double analgesia

.22 application ceased

[illegible] with [illegible]

.27 [illegible] complete analgesia and anaesthesia, extend upwards at 2" above wrist band

.30 [illegible] return

.30½ Recommenced strong anaesthesia and analgesia superficial

commenced at a lower frequency for

.34½

.35½

36.
36½ Throughout

Paraesthesia very marked

Dr Alwood had same current as last with marked analgesia and anaesthesia

8.41 electrode over [illegible] of 8th found more other [illegible]

8.46 slight anaesthesia

.47½

Unable to buy [illegible] properly owing to hyperaesthesia

Employing Rheostat and secondary barrels to interrupting electrode showed different contraction in extensor indicis with the two poles one much stronger than the other. This was [illegible] in three observations

It was noticed in lower dyes with small alternator

It did not occur at all with large alternator.

478		479	482	480
0	0	0	0	0
2.5		20.6		21.9
5	43.7	43.3	45.3	44.5
7.5		65.9	67.7	66.7
10.0	88.5	88.25	91.1	88.4
12.5	108.9	109.11		108.9
15.0	125.3	127.4	125.3	125.8
	V			V

483	484	485
0	0	
21.5	22.0	20.7
43.3	43.8	43.4
64.6	65.8	65.1
86.4	87.6	87.7
108.0	108.1	108.3
125.3	124.4	125.5
V		V

488	486	473	489	494
0	0	0	0	0
21.6	22.6	22.4	21.4	21.4
43.5	45.3	43.7	42.7	43.1
65.5	67.2	65.6	63.7	64.9
87.4	89.0	87.4	85.5	87.1
107.6	108.9	107.4	107.2	108.9
123.6	125.4	123.9	125.3	123.6
	V		V	

43.7	88.5	20.6	66.7	108.9
44.4	88.4	21.9	67.2	105.9
45.3	89.0	22.6	63.7	107.2
42.7	85.5	21.4	64.6	108.0
43.3	87.1	21.5	65.1	108.9
43.4	86.4	20.7	27.3	41.8
22.8	87.7	8.7	.54	8.3
43.8	5.6	21.7		
	88.8			

27 30
9 00
264 0
11 | 1213
1.11

2 00
30
33 00

388

P. & G. cold 5480 w TB 23.3°C

1st Cement on at 10.55 — 920 w added to grid in 11 — 760 w at 11.45 — 5820 @ 15.0 — 1401 Rhine

109 avail — 505 @ 16.25

1854 vole

480 w @ 17.55

11.06 — 2495 w added to grid in 11 — 2435 @ 16.45

2430 @ 17.90

11.11 — 910 w added to bay grid — 925 w @ 16.50

cv. 200,000 bar — 930 w @ 17.22

11.42 — 170 w added to 600 w — 155 w added to 600 w

155 w @ 17.36

5500 w on f. 9

2745
920
3665

2745
480
3225

1.136

388 | 136

35.05°C 87

2495
2745
52.40

2745
2420
5165

1.0640 3.35

2745
420
3165

2745
930
3675

1.0057 1.5°

2745
420
3165

2745
455
3200

1.0050 2

13.5
0.5 P g 13.5
0.5

2.42 = 1.21 0.8264
6.5 0.0153
0.6734

R = 0.6734 = 6.12
12.57

7.65 1000
0.6734

R =

34 X 35.5 without fan
19.5 X 35.5 with fan

19.5
71
195
1365
13845
692

28 X 35.5 without fan
17.5 X 35.5 with fan

17.5
175
245
35
62.25

1420
1050
370

1.5 low 0.55 D
0.75 d

0.1 mm
0.076 mm drain silk cond
2.42 low
39.20 cogh
40.5 warm

glass beaker 13.05 ent
mass 0.38 g

thermometer + bulb 79 g

full 181.0
164.4
16.6 g

79.0
16.6
16.4

$R_2 = 4.25$

$= 6.2$ 0.2

4.10 1.30 0.3

$\frac{4.25}{4.10}$ 1.30

$\frac{4.25}{4.10} = 1.038$

77 cm 0.394 m 25°C

0.058 × 0.010 0.0058

$\frac{394}{77} =$ 2.68

0.6820

$\frac{10}{3.10} = 0.03$

$P = 30.6$ watts

$\frac{d\rho}{\rho} \left(\frac{1}{r} - \frac{1}{R}\right)$

$\times \frac{1.25}{1.25} = 30$

$= 55$

17.13 current 2.1 [illegible]

1.15 76°

17.43

99°C 24.8°

2 × 1.125 = 8.10 amp

17.58

101.5° 25.0°C = 76.5

1.105 × 2 1.11 amp

1.28 watts

$\frac{76.5}{2.56}$ 6.12

$\frac{765}{30.6} = 25$

$\left(\frac{1}{r} - \frac{1}{R}\right) = 1$

$d\rho = \frac{\alpha}{4\pi r^2}$

$= \frac{\alpha\, dr}{4\pi r^2} = \frac{\alpha}{4\pi}\left(\frac{1}{r} - \frac{1}{R}\right)$

$e - jl$

$l = \alpha \mathcal{T}$

$$\gamma = \Gamma\left(1 - \varepsilon^{-\frac{\mathcal{T}}{\tau}}\right)$$
$$= \Gamma\left(1 - \varepsilon^{-\frac{\mathcal{T}}{\tau}}\right)$$
$$= \beta \frac{\mathcal{T}}{\tau}\left(1 - \varepsilon^{-\frac{\mathcal{T}}{\tau}}\right)$$

WITH THE ELECTRICIANS.

The city statistician of Chicago reports that there are 150 establishments for "electric lights, works and materials" in that city.

The Western Electrician rejoices in the fact that the erection of an elevated railroad in Chicago is now operated by the use of electrically transmitted power. It is to be a north side road.

The tallest building in Stockholm, Sweden, is the large iron lattice-work tower of the central telephone exchange. Myriads of wires radiate from it, distributing the city. Every one in Sweden uses the telephone, and uses it, moreover, very much.

A single rail electric railway is said to be projected between Reserve and Cortland, via either Albion or Medina, to practically test Capt. Bliss' Bicycle Railway patents. The invention has been tried on a short test line, and has been found, it is said, to work in a perfectly satisfactory manner.

One of the largest electric cranes in the world is now at work [illegible]

0.63 amp. between Sp. 1 & 0.
0.82, 0.505 9
0.55 15

0.62	0.344		
0.92	0.546	0.462	9.5
1.01	1.020	0.636	12
1.06	1.124	0.720	15
1.11	1.232	0.845	20
1.17	1.369	1.085	28
1.08	1.166	0.760	19
1.03	1.061	0.664	13.5
0.975	0.950	0.553	11.3
0.95	0.903	0.506	10
0.63	0.397	~~0.506~~	2

0.64	0
0.925	0.5
1.030	14.5
1.040	18.5

0.66	372		0	0
1.030	1.061	0.850	8.4	1
1.06	1.124	.769	11.2	2
1.11	1.232	.660	13.6	3
1.17	1.369	.597	19	4
1.24	1.538	[illegible]	25	5

Ammeter 15 amp. &
ammeter 0.9, 15 &
{Tues, Aug. 12. a.m. '93} — 15 D.

Comparison of the two ammeters,
Even scale on 15 ampere meter, —
comparing with the 15 on D.

1st)		2nd)	
1	ampere	0.9	
2	"	2	
3	"	2,8	
4	"	3,8	
5	"	4,9	
6	"	5,9	
7	"	6,9	
8	"	7,9	
9	"	8,9	
10	"	10.	
11	"	10,9	
12	"	12.	
13	"	12,9	
14	"	14	
15	"	15	

One scale meter,

Three scale meter

Note. No 1 is the meter having the three scales & no 2 is the single 15 ampere meter!
specified by (1st) & (2nd).

No. of revolutions of meter according to current strength

At 1 ampere current 1¾ revolutions per min.

at 2	amperes	current	4 rev. per min.
at 3	amperes		6 rev. per min.
at 4	amperes		8 rev. " "
at 5	amperes		10 " " "
at 6	"		12 " " "
" 7	"		13½ " " "
" 8	"		16 " " "
" 9	"		19 "
" 10	"		20½ " " "

~ Monday Aug. 14 '93 ~

No. of revolutions on even scale of amperes.

At 1	amperes	2 rev. per min.
" 2	amperes	4½ " " "
" 3.3	amperes	6½ " " "
" 4.1	amperes	8 " " "
" 5.3	amperes	10½ " " "
" 6	amperes	12¾ " " "
" 7.6	amperes	13½ " " "
" 8.6	amperes	16 " " "
" 9.4	amperes	18 " " "
" 10	amperes	19¾ " " "
" 11.7	amperes	22¾ " " "
" 12.4	amperes	23 " " "
" 13.2	amperes	26 " " "
" 14.5	amperes	26¾ " " "
" 15.5	amperes	26¾ " " "

Test of Motor Metric, Thurs. Aug. 17.

Ampere	D	Revs per min
1.	0	"
2.	2.	"
3.	4.	"
4.	6 7/15	"
5.	8 4/15	"
6.	10 1/30	"
7.	12 11/30	"
8.	14	"
9.	16	"
10.	18 1/2	"
11.		"
12.		"
13.		"
14.		"
15.		"

14. 1 revolution of the dial is equal to 140 revolutions of the cylindrical weights.

C	Nom	
10.0	17.7	1.77
9.0	15.8	1.76
8.0	14.0	1.75
7.1	12.5	1.77
6.0	10.7	1.77
5.0	9.0	1.80
4.0	7.0	1.75
3.0	5.3	1.73
2.0	3.5	1.75
1.0	1.5	1.50
0.5	0.6	1.60
15.0	26.0	1.73
15.0	26.5	
15.0	25.5	
19.	32	1.68

$\frac{1/32}{12}$ | 1.68

$\frac{1}{25.0}$

2

Bombay [illegible] 19th Septr

Date			
1	95w	26	95.5w
2	95	27	100.5w
3	95	28	97.5
4	99	29	96w
5	99	30	99
6	96	31	97.5
7	95	32	96.5
8	95	33	97w
9	99	34	98w
10	97	35	96w
11	95	36	95w
12	94	37	97w
13	97	38	96w
14	96	39	95.5
15	95.5	40	97w
16	97	41	97w
17	95w		
18	97.5		
19	96		
20	98w		
21	97w		
22	97w		
23	95w		
24	95w		
25	96w		

mean 95

Bolide [illegible]

Kymograph [illegible] 12h Cycle

Base [illegible]

-5	2069	11498	2066	588
-4	2069			
-3	20.53	1522		531
-2	2021	1484		617
-1	1804	1195		600
0	~~4435~~ ~~4755~~ 4941	3718		1233
	4953	2981		1972
	read from index 18 4835	lower plate ~~2254~~ 2254		2581
	4882	1841		3041
	5014	1794		3220
5	5378	1730		3648
	5112	1035		3777
6	5391	1375		4016
7	5314	1417		3897
8	5172	1970		3202
9	5788	2843		2295
10	5521	3955		1566
11	5651	4788		863
	read from upper line 5446	4862		604
13	5674	5040		634
14	5735	5045		690
15	5238	4538		700
16	5233	4197		1036
17	5276	3576		~~1700~~ 1680

18	upper line 5561	3072	2489
19	5572	2504	3068
20	5665	2310	3355
21	5891	2234	3657
22	5754	1961	3793
23	5758	1657	4101
24	5691	1668	4028
25	5577	2208	3369
26	5578	2907	2671
27	5511	3668	1843
28	5516	4303	1213
29	5444	4733	731
30	5532	5017	515
31			
32			
33			
34			
35			

	Base	Curve.			
−5	5182	4595		587	588
−4	5352	4843		509	531
−3	5457	4841		616	617
−2	5806	4966	→	940	654
−1	5745	4545	169	1245	1233
0	5830	3833		1997	1972
1	5815	3237	147	2568	2541
2	6019	2723	→	3296	3041
3	5471	2187	→	3284	3535
4	5526	2094	→	3432	3646
5	5472	1784	→	3688	3777
6	5500	1488		4012	4015
7	5728	1827	1798 694	3991	3897
8	5774	2617	→	3157	3206
9	5761	3535	→	2226	2245
10	5635	4040	164	1698	1566
11	5753	4889		864	843
12	5991	5388		603	604
13	5874	5350	→	524	534
14	6017	5460	→	557	600
15	6265	5555		710	700
16	6343	5280	→	1063	1036
17	5533	3843		1690	1694
18	5836	3349		2487	2469
19	5353 ~~5752~~	2311 ~~2960~~		3042 ~~3692~~	3068
20	5638	2392	→	3246	3355
21	5830	2273	→	3557	3687
22	5575	1767	1681	3808	3793
23	5672	1574	199	4098	4101
24	5752	1745	30	4007	4023
25	5747	2405	→	3342	3364
26	5830	3176	125	2654	2671
27	5842	3979	106	1863	1843
28	5865	4613	→	1252	1213
29	5860	5152	→	708	721
30	5936	5421		515	515

	Back	Curve	D
-2	5445	4596	849
	5446	4580	866
2	5556	2519	3037
3	5589	2309	3280
4	5622	2100	3522
5	5676	1994	3682
8	5725	2556	3169
9	5777	3532	2245
13	5884	5256	628
14	5809	5219	590
X 16	5871	4850	1021
20	5553	2513	3370 Curve
21	6002	2464	3538
25	5974	2420	3554
L 28	5903	2606	3369
29	6050	4742	1161
		5315	735
X 16R	5875	4875	1000 Correct
L 28	5931	4746	1185
28	5913	4738	1175

Outside Readings

984	365	5-1835	(27)	11224	386	
1019	352	4 (1844)	2777	11562	308	
1171	372	3087	(23)	(11949)	(5486)	
2108		3487			387	5722
2403 (R)		3769	382		361	6083
2773		0- 4136	367		328	6411
3111	(1)	4487	351		348	6759
3424	361	4788	301		311	7070
3746	2985	5111	323		329	7399
4[illegible]	3238	- 5522	411		(30)	7728
4464	2501	5826	304		327	
4751	2918	6164	338			
5112	2149	6469	305	Curve		
5463	2500	6822	353		9575	8912
5829	1[illegible]	7187	359		10198	9206
6109	(10) (11)	7467	286		10579	9616
6485	5522	7852	385		10852	9919
6806	5743	8163	311		11232	(8954)
7167	6294	8522	359		10269	9113
7537	6294	8904	382		8890	9453
7854	6491 (18)	9208	334		8401	9764
8171	7094	9525	317		9132	10095
8499	7536	9858	333 (30)		9483	10446
8839	7626	10169	331			
9199	8336	10552	383			
9521	(20) 8448	10888	336			

2nd Lot

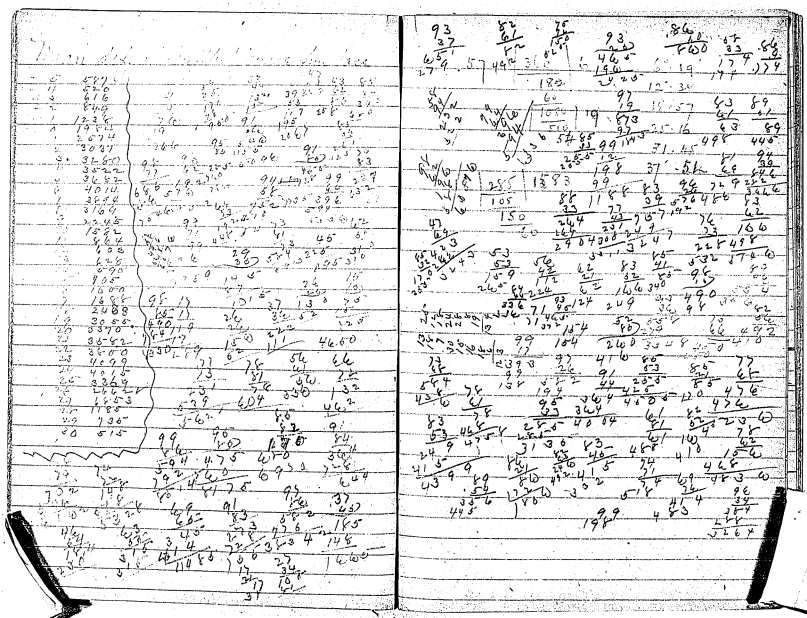
1	1385		1232	110 71
2	339		339	340
3	372		372	1137
4			1463	963
5	387 (3)			
6	295 (4)	1113	1063	1094
7	370 (4)	262	34	
8	395 (4)	1389		1191
9	319 (4)	1389	1222	
10	322	301	227	311
11	426	273	1463	1222
12	392	317	962	963
13	317	304	1459	1459
14	381	338	1263	
15	385	385	347	
16	384	384	2924	1194
17	382	382	962	2316
18	376	376	1941	
19	371	371		
20	361	311		
21	370	369	2916	
22	319	384		
23	327	304	1461	1246
24	325	379		30
25	348	348	1277	
26	350	347	2253	2246
27	322	353		2243
28	354	336	1459	1093
29	323	323	1263	
30	387	334		
31	303	387	2222	
32	360	326	2253	1322
33	359	359	164	311
34	311	345		1263
35	337	377	1459	1222
36	381	352	329	1190
37		344	1263	
38			2253	1246
39			1459	1263
40				1190
41	1264			
42	349			
43	1263			
44	1222			
45	1190			
46	1246			
47	1263			
48	1222			
49	1190			
50	1246			
51	1263			
52	1222			
53	1190			
54	1246			
55	1263			
56	1222			
57	1190			
58	1246			
59	1263			
60	1222			

Back

1	0	1	0	0
2	364	2	364	376½
3	728	3	734	734
4	1145	4	1192	1139½
5	1420	5	1416	1425
6	1810	6	1780	1796½
7	2148	7	2139	2161
8	2461	8	2438	2448
9	2788	9	2788	2740½
10	3209	10	3169	3167
11	3501	11	3493	3467
12	3815	12	3877	3871½
13	4149	13	4216	4092½
14	4500	14	4469	4485½
15	4768	15	4828	4844
16	5122	16	5114	5130
17	5443	17	5509	5516½
18	5785	18	5813	5846½
19	6205	19	6169	6188½
20	6474	20	6537	6532½
21	6791	21	6852	6852
22	7208	22	7172	7172
23	7596	23	7513	7524½
24	7876	24	7816	7846
25	8136	25	8199	8217½
26	8545	26	8535	8537½
27	8912	27	8871	8891½
28	9285	28	9288	
29	9676	29	9996	9996 Change
30	9919	30	3158	3181
31	12368 Change	31	3369	10193
32	8763 = 12000	32	3790	10621
33	8490	13945	4058	10889
34	8801	11659	4406	11183
35	9121	11892	4712	11189
36	9453	11941	5042	11497
			3395	

Brierley from Lot 22.

37	295½	349	22	9220
38	2550		23	9476
39	3062	356	24	9831
40	3417	355	25	10162
41	3772	331	26	10500
42	4256	382	27	10848
43	4421	355	28	11231
44	4803	382	29	11533
45	5185	382	30	11889
46	5461	356		



Fast zero wave

1	.04 x .03 =		.0012
2	.14 x .10 =		.0168
3	.19 x .14 =		.0266
4	.25 x .34 =		.1020
5	.32 x .44 =		.1408
6	.39 x .53 =		.2067
7	.40 x .62 =		.2666
8	.47 x .7 =		.3290
9	.50 x .77 =		.3850
10	.58 x .80 =		.4640
11	.60 x .91 =		.5946
12	.65 x .84 =		.5460
13	.62 x .98 =		.6076
14	.64 x .99 =		.6336
15	.67 x .70 =		.4690
16	.71 x .99 =		.7029
17	.72 x .91 =		.7646
18	.83 x .95 =		.7885
19	.85 x .91 =		.7735
20	.85 x .84 =		.7140
21	.83 x .79 =		.6557
22	.61 x .73 =		.5913
23	.79 x .64 =		.4672
24	.62 x .85 =		.5410
25	.57 x .40 =		.2280
26	.39 x .35 =		.1015
27	.26 x .25 =		.0650
28	.15 x .15 =		.0225

29	.04 x .04 =		.0016
30	.06 x .06 =		.0036
31	.17 x .17 =		.0289
32	.26 x .26 =		.0676
33	.36 x .37 =		.1332
34	.46 x .50 =		.2300
35	.56 x .61 =		.3416
36	.66 x .72 =		.4752
37	.73 x .77 =		.5621
38	.78 x .81 =		.6318
39	.85 x .83 =		.7055
40	.91 x .84 =		.7644
41	.95 x .85 =		.8075
42	.95 x .85 =		.8080
43	.99 x .86 =		.8514
44	.10 x .86 =		.8600
45	.99 x .86 =		.8514
46	.99 x .86 =		.8342
47	.95 x .85 =		.8075
48	.91 x .83 =		.7553
49	.85 x .82 =		.6970
50	.79 x .74 =		.5846
51	.72 x .74 =		.5328
52	.65 x .69 =		.4485
53	.55 x .63 =		.3465
54	.46 x .54 =		.2484
55	.37 x .45 =		.1665
56	.27 x .34 =		.0918
57	.16 x .27 =		.0432
58	.09 x .09 =		.0081

1	-1.00	×	+.03	=	-.0300
2	-.98	×	+.12		.1188
3	.97		.19		.1843
4	.93		.25		.2325
5	.88		.33		.2904
6	.83		.39		.3237
7	.77		.43		.3311
8	.69		.47		.3243
9	.62		.5		.3100
10	.53		.53		.2809
11	.42		.56		.2352
12	.33		.57		.1934
13	.21		.62		.1302
14	.10		.64		.0640
15	.01		.67		.0067
30	+1.—		-.04		.0600
17	.99		.17		.1683
18	.97		.26		.2522
19	.93		.37		.3441
20	.89		.50		.4450
21	.82		.61		.5002
22	.75		.72		.5400
23	.65		.77		.5236
24	.61		.81		.4941
25	.53		.83		.4399
26	.44		.84		.3696
27	.03		.85		.2595
					+.4930

16	-		+.11	× +.71	= .0781
			.22	.77	.1694
			.32	.83	.2656
			.41	.85	.3485
			.52	.86	.4472
			.61	.83	.5063
			.69	.81	.5589
			.76	.73	.5548
			.83	.62	.5146
			.89	.57	.4539
			.94	.39	.3666
			.96	.26	.2496
			.98	.15	.1470
			.99	.04	.0396
			7.10		+ 4.6
					+4.9939

43		+.21	× -.50	=	-.1050
		-.56		=	-.0946
44		+.01	-.86	=	-.0086
					-2.617
					-7.4630
					-7.7247

45 = 0.1000	× .46	= +	.0860
	.21	.46	.1806
	.32	.85	.2720
	.45	.83	.3735
	.52	.82	.4264
50	.62	.78	.4836
	.71	.74	.5254
	.76	.69	.5244
	.82	.63	.5766
	.89	.54	.4806
55	.93	.45	.4185
	.96	.34	.3264
	.99	.21	.2079
58	1.00	.09	.0900
			7.65
		+	49.119
		or	4.6929
			49.6048
			−7.7(8464)
			+41.8601

24.8331 sin + 1.8601 cos.

7.0012

$\frac{49.666}{58} = 0.8564$ $\frac{1.8601}{24} = 0.0774$

10°	0.1736	0.1487	.011
20°	0.342	0.293	.022
30°	0.50	0.428	.032
40	0.643	0.551	.041
50	0.766	0.656	.049
60	0.866	0.742	.055
70	0.940	0.805	.060
80	0.985	0.844	.063
90	1.0	0.856	0.064

1.6510

.8982

204.5) .7228 | .8982 .8371 .0611

.8982 | 8716

196.5

106.5 × 0.426 = 0.8370

.8982

1658

.8982 | 7324 1658 | 8156 0.0[illegible]

13.7343 = 0.4373π = [illegible] ordinate

$K\pi$ = 0.4736π = 0.9472

Test of am. meter Sept 15th '93

no. of ampères	no. of rev. per min.
4.2	$1\frac{13}{47}$
5.2	$2\frac{14}{29}$
6.1	$3\frac{3}{5}$
7.0	$4\frac{27}{53}$
8.0	$5\frac{5}{14}$
9.2	$6\frac{6}{11}$
10.2	$8\frac{4}{7}$
11.1	$8\frac{7}{17}$
12.0	$9\frac{3}{8}$
13.3	$10\frac{10}{27}$
13.9	$10\frac{6}{7}$
14.3	12

14.8	12½

Tests of Annulus (continued) Sept 15

No. Cam.	No. rev.	Time.	Rev per min
2	1	61	.98+
3	2	60	2.0
4	2	64	2.14+
5	4	58	4.13+
6	5	56	5.35+
7	7	63	6.66+
8	7	53	7.92+
9	10	64	9.37+
10	10	56	10.7+
11	12	66	10.9+
12	12	60	12.0+
13	14	65	12.8+
14	14	55	13.45+
15	15	60	15.—
16	15	60	15.—
17	17	60	17.0
18	17	59	17.28+
19	18	59	18.3+

Continued

20	19	60	19
21	20	60	20
22	21	60	21
23	22	60	22
24	22½	60	22½
25	23	60	23
26	24½	60	24½
27	26	60	26
28	27	60	27
29	27	60	27
30	28	60	28

19. IX - 93.

Right amp. circuit

O.H.O - this wk.

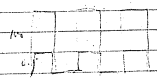
bit write on wk

60 - lmp

50 × 0.5 = 25 volt

50 × 0.5

= 25 V



0.25

50 × 0.25 = 12.5 volt

100 × 0.5 = 50 = 25

100/2 × 0.5 = 50 × 0.25 = 12.5 volt

Test of a Thomson Watt-meter, Sept 21 '93

Amperes used			rev	time
1/4	per minute 1.66			
1/2	2		2	60 sec
1	2.47	2.916	2	46 "
2	4.25		3	42 "
3	5.55		5	54 "
4	7.0		7	60 "
5	7.8		8	61 "
6	9.47		9	57 "
7	10.9		10	55 "
8	12.2		11	54 "
9	13.3		12	54 "
10	15.0		14	57 "
11	16.0		16	56 "
12	17.47		16	55 "
13	18.9		18	57 "
14	19.6		20	61 "
15	21		20	57 "

Amp.	Rev.	Time
16.3	21.7	60 sec
11.7	17	60
8.4	8	60
5.85	8	60

3	5	60
3	5.5	60

Same lots Light = 2

4 amp rev in 60 sec @ 1.666

1.0	2	57	= 2.916
2.0	4	60	= 4.
3.0	5	59	= 5.07

2.95	5.2	60 sec
2.0	3.75	60
1.5	2.6	60
0.43	1.6	60

Test of Thomson's Recording Watt Meter, Sept 23rd 1893

Amperes	Rev.	Time	Revs per Amp
.5	1	38	15.7
1.0	2	34	2.35
2.0	4	62	3.87
3.0	6	59	5.07
4.0	7	64	6.56
5.0	7	56	7.5
6.0	9	60	9
7.0	[illegible]	59	10.1
8.0	12	62	11.6
9.0	12	58	13.0
10.0	14	59	14.2
11.0	15	57	15.7
12.0	16	56	17.1
13.0	17	57	17.8
14.0	18	57	18.9
15.0	20	59	20.3
16.0			
17.0			
18.0			

Meter prices for October, sent out. Weight of each.

1.	36.591	25.	42.916
2.	35.207	26.	43.784
3.	46.784	27.	45.148
4.	48.047	28.	37.847
5.	38.986	29.	47.278
6.	38.155	30.	47.610
7.	46.838	31.	48.770
8.	38.555	32.	49.726
9.	46.696		
10.	33.977		
11.	34.890		
12.	38.150		
13.	39.774		
14.	47.325		
15.	38.178		
16.	46.880		
17.	46.647		
18.	34.954		
19.	44.588		
20.	47.602		
21.	46.849		
22.	46.392		
23.	38.127		
24.	39.449		

Kinks in wires. Oct 6 to 1893.

Platinoid wire 10% Iridium { Res. 4175 ohms (including leads.) Length 747 cm.

(Robertson Cornish) After drinking (heated while hot) (Central times): - Res = 399.7 ohms

Kinked slightly more; - Res = 400 ohms

[illegible] (Central times): - Res = 400.2 "

(Daughter left for Hanover) " " " - " = 400.0 "

" " " - " = 401.0 "

" " " - " = 401.2 "

Heated by electricity current (Wire stretched about magnetic accidentally) while hot. 402.0 "

(Rest from Hanover and electricity discharged)

16.75°	16.75
25.0	11.75
42.2	17.2
48.4	6.2
58.1	10.7
67.2	9.1

Repeated again - Res = 404.3 "

" " = 405.0 "

Oct 9 to 1893.

2.845 ohms res. } Platinoid sample
77 cm. length. }
.036 dia = .0027 ohms

$\frac{30.45}{77} \times 2.845 = .1128$ " per foot

0.01127 " dia = 70 ohms per "

10° = 70.0 ohms

$0.350 \times 3.1416 = .0785$

Total length = 549.78 = 550 feet

Another wire - 0.016 - 0.0104 " diam

3.915 " 71 cm = 0.055 " per cm

= 1.675 " per foot

950 ohms × 1.67

$71 \overline{)3.915}$ (.055
365
100

0.0057" 19.33 " per inch $\frac{1933}{58.0}$

1750 ohms of wire × 4.6 "

Oct 16 1913 Chang Lab.

Kinks produced in air, water, oil and vacuo.

Plat-10% (medium) wire test for showing kinks. Then in order German silver, copper. Kinks produced in air & in water. Also when silk wound in air. Immediately upon forming upon surface of liquid the wire sinks (or nearly always) probably owing to surface tension produced by impurities or by adjoining liquid.

Natural plane of Plat-Ir wire produced kinks perpendicular to plane of flat surface.

Kinks produced when surface of liquid sinks or wire is raised towards plane of said surface.

Oct 17 1913

Plat-Ir wire & Plat-wire in air. Plat-Ir kinks most decidedly. Time to kink — copper wire showed no change.

10 Plat-Ir (2) German silver (3) Plat wire in air.

Plat-wire kinked perfectly.
Copper " " lib.
German silver " none.

Plat-Ir wire; l = 470 cm dia = .0060
Res = 26.0 ohms.

German silver; l = 46.6 cm. dia = .01025
Res = 14.23 ohm

Copper wire; l = 28 cm dia: 0.005
Res = 2.25 ohm.

~~Plat-Ir wire l = 41 cm dia 0.105~~
~~Res = 20.43 ohm~~
~~German silver wire l = 50 cm dia 0.105~~
~~Res =~~

Plat-Ir wire l = 41 cm. dia 0.105
Res. 17.50

German Silver l = 50 cm dia. 0.105
Res = 20.82

Two of these samples were included in resin with a portion of Cu wire 0.005 cm. dia. The Standard wire

used first on this occasion for first time. Cu kinked strongly the wire could not be kinked till Cu melted. Afterwards G.S. wire could then be kinked once Pt-Ir wire not at all.

Longer piece of Pt Ir wire, then [illegible] alone not kinked under prolonged discharges

Cu. Wire dia. .005 kinked strongly Easily.
" " "
" " "

Took Cu wire 0.002 diam but failed to produce kink.

65

65 ⊖ 1/9 720

6900 25 / 5732 110

18th Oct. 03

Pomp. [illegible] candle back 4½
Right out 5½"
" in 1½"
Breath out 5/16"
" in 4/16"
Debt out 4½ [illegible] feet
" in
0.345 g
Bu. [illegible] out = 18 inches
Bu. [illegible] out
Magnet spirits 15° 35-50
" acid 20° 35-55
boot filled Salt spirits 15° 35-50
" Plumbago " gravity 35-infin.
Auditor Insp.
Right out
" in
Middle out
" in
Left out
" in
Mean.
Left [illegible]
filled Camphor [illegible] 45-60-90-60
" NaOH 2 spirits .10-50

boot filled Potass Bro. mag 10-35-
Sodium Sulphate mag 20-35
Mutter Tincture "Plumbago
Potass Tartrate [illegible] 12 [illegible]
Epsom Sulphate 65 = 45
filled Sugar 45 = 36 (11-79)
" Sodium Phosphate 15-35 = 10
" Glauber Salts 40-110 = 70
" Sodium Sulphate 50-95 = 45
" Potass Phosphate 30-65 = 35
" " Bromide 12-45 = 33
" Mag SO 45-91 = 43
" Chloralhydrate 32-72 = 40
" Camphor 14-95 = 81
" NaCl 35-90 = 55
" Ammonium Tartrate 30-72 = 42
" Carthamin 1-15 = 25
" Mono Cu Copper 15-90 = 72
" Cuprum Sul Sulph Fus. mag (1 sur. mb. not mon. sach.)
" Copper Per Mag. an 84-135 = 94
" Cupr-Sulfo-Carbol 45-110 = 55
" Copper Phosphate 15-38 = 55
" Stannum Metal Mag. 3 sur. not mixed.
" Cuprum Chloric 17-65 = 51
" Cupr-Citric 25-110 = 55
" Bromide Copper 15-50 = 25
" Cuprum Nitr fused 45-80 = 85

21.6 15-7

Cupr. Formicic	30-75 =	45
" Iodat	17-55 =	41
X Perchloride Copper	6-16 =	16
Copper Nitric	7-50 =	42
" " hydratic	60-155 =	155
X Cuprum Oxalic	7-20 =	12
Iodate Copper	28-110 =	82
Cupri Citricus	52-80 =	28
Cupric	35-50 =	15
Cuprum	51-95 =	44
Barium Carbonic	45-67 =	22
Cimicarin	17-50 =	33
Cupric Sulphas	10-30 =	20
Hydride Copper	43-60 =	37
Carynum Oxydat (Cerium)	30-85 =	55
~~Cuprum Iodatum~~		
~~Cuprum Oxydat Nigrum~~ nec		
Cracca. Sal. Chrom. Pur.	45-75 =	30
Cuprum Iodat	15-35 =	20
Tormentil Iodat	10-40 =	30
X Plat. Cyanatetally	5-23 =	18
~~Cuprum~~	~~10-30~~	~~20~~
Cu "	0-14 =	14
Thallium "	0-30 =	30
Aurum " Simply mag.		
Manganic "	25-150 =	125
Calcium "	=	70

Cetrul Iodat (liquid)		
Strychnine "	0-30 =	30
Lithium " (half liquid)		
X Plumb " dia. mag.		
~~Barium " 0-12 = 12~~		
Magnes " sulphur nitric		
Ferrum " simply mag.		
Silicium " 14-50 =		36
Juca. " 10-30 =		20
Hydr. Bijodat Pur. 35-65 =		30
Baryum Iodat (sulphur liquid)		
Mercur " 15-70 =		55
~~Argentum Sulphuric~~		
Cadmium, iodide - lutes 1 nr		
alt sulpho Carbamid dia. mag.		
Potass. iodas - lithi nr cal nr		
Sulphur iodid - ars nr		
Aconitin nitric amorph 2 nr		
" sulphuric 19		
" amorph four fulv 21		
Acid Tarrochloric	70	
" Boracic (fund)	90	
" Tartaric	22-50 =	28
Acid Citric	40	
Ammon. Sulphocyanate	15	
Aluminum Bromide	20	

Albumin	45
Alumina oxalic	85
Alumen Chromate	43
Acid Tiltanic	30
" Tannic	56
Alumen Bromide	15
" Phosphate	35
" Benzoic	30
" Acetic, Dec.	27
" Nitric	27
" Chloride	48
Ar Oxygen Calc. Simply mag.	
Alumen Sulphate	30
Alum pure common	3 pur did not more
Alumen Kalic, Pur	15
" Natric	15
Alumen (Alum)	30
" Sulfuric	15
" Dabate	35
Acid Citric	wk. pur
Barium Bromate	50
Barium Nit.	
Barium Chromic	35
Barium Chlorate (cryst)	Simply mag.
" Chloride (Pure)	33
" Hydro oxydate	100

Barium Acetic	19
Bebri Caustic (cryst)	20
Barytes Carb	10
Cuprum Reduct.	simply dec. mag.
" Arsenicus	" mag.
Cupr Acetate	60
Cupr Ammoniated	87
Cupr Ammon Sulphate	100
Cuprum Metal	35
Barium Sulf. Trace Pur	15
Cuprum Borasic	100
" Monochloride	45
" Bromate	
" Acetate (cryst) C.P.	140
Cupri Sulphas C.P.	35
Cuprum Arsenicic	35
Verdigris (powdered)	simply mag.
Cuprum Dichloride	107
Carbon - H_2SO_4 on Sugar in cold	85
" - Phos. anhydride on Sugar	40
Copper Carbon	88
Cocain. Hydrochloric	25
" Hydrobromic, Christ	32
Codein Hydrochloric	85
Colocynthidin (Caulin)	74
Cocain Nitric	Tetro cocain nitrate
Cocain Hydrochloras	simply mag. 15

Codeine White	42
" pure	Dis. Mag.
Colchicine Purissimum	about 20
Codeine Hydrochlorate	32
" Iodohydrate	35
" Sulphate	36
" Phosphate	20
Cerium Ammon. Sulphate pur.	Very S. M.
Conchinin	55
Cochineal	S. M.
Chloral (Hydrate Schering)	50
Cetate Cadmic	About 156
" Arsenate	S. M.
" Chromate	103
" Oxalate	60
" Sulphate	S. M.
* " Nitrate	Pure Strongly Dis. Mag.
" Nitric (crys.)	" " "
" oxydat	" Mag.
" Phosphoric	dis. Mag.
" Ammon. Sulphate	" "
" Acetate	" "
" Oxide Com.	S. Mag.
Atropin Hydrochloric	about 60
" Hydrobromic	" 125
" Valerianic	Strongly Mag.
" Salicylic	" "

Med.

Barium Bromide	25
Arsenic White	30
" Sul Citrin	Mag. S. M.
" oxyd	90
" Metal	S. M.
Arsenious Acid	40
Acetic Pur Pur Glacial	S. M.
Acid Phosphoric	S. M.
" Salicylic	25
" Silicic	S. M.
" Euchlorodic	35
" Tannic	12
" Gallic	60
" Vanillin-Sacc.	15
" Lactic	90
" Hydramic	55
Lactose Lactis Pures	25
Acid Picronitric	15
" Salicylicum Amylic	102
" Rosolic	50
Stibium Arsenicus	dis. Mag.
~~" Chlorat pulverised~~	
" Metall crys.	120
Antimony oxydat	47
" Pulverized	S. M.
" Metallic	S. M.
" pentachloride	15

Antim. Thiosaurat. Sol.	40
Apiolin Ethydsaurat	40
Arsenic Chlorhydric. c. pulph.	20
Atropine Sl. Pilogo. Sulph.	95
" Sulph. Smithi.	15
Etrium "arsenic	70
" oxydat. nat. alkt.	135
" " alk. Ph. Bor. (Ethic. acid)	20
Calcium Iodate	35
" Iodic	about 45
Quinoidinum	15
Aniline (Sulph.)	30
Chrom. oxydat. Kydric	100
Antimony Tartrate	13
Cinchonidia Sulphate	10
"	12
Cyclamen chloride	12
Chaysarobin	30
Cinchonin	35
Chromium Sulfate	S. M.
Cinchonidin salicylic	10
Chromium Chromate	98
" tannic	35
Cinchonia Sulphate (Sulphate)	60
Chrysin Sulph. alkt.	about 25

Chinoidin	65
Caffein	40
Cartmium Trischlorat	23
Cerium oxalic oxydat	105
Cotracein (depur. Sulf.)	25
Chinoidin Sulfuric Sicc.	43
Fluoresceïn	23
Chinolin Tartaric	51
Ar. chloride. pur.	25
" hydrochloric	10
Chinolin Sulfuric	21
" Salicylic	S. M.
Cerium Sulfuric (oxydulat)	85
" Nitrate	38
Caesium Rubidium Chlorat	15
Aniline Sulfuric	15
Cerium oxydat (pure)	48
Analin Chrysoidin Arsenic	25
" Blaum Fluorhy	170.
Acid Phospho-Organic	20
" Phosphoric Hydro.	70
" " Glacial	135
Ammonia Sulphate	39
Acid Tranexamic	12
" Citric	60
" Pectinic	20
" Molybdic	S. M.

Acid. Meta-phosphoric	33
" Monochloracetic	40
" Gallic	50
" Picric	42
" ~~Malic~~ Malic	S.M.
" Cresotinic - edwi	20
" Parahydroxybenzoic "	55
" Oxybenzoic " para	40
" Lithium " (meta Acid)	39
" Oxybenzoic " (meta)	12
" Iodo-hydroxynat	20
" Magnesium	11
" Hippuric esp.	30
" Opanic	37
" Hydrocyanat	65
" Potassium saccharin	S.M.
" Cresotinic	110
" Cinnamic	37
Chlorotid	120
Ammon. Oxalic	15
" Oxalate	35
" Nitrate fused	17
" " cryst.	14
" phosphate-monobasic	20
" Phosphate (A.P.)	13
Acid Tannic	S.M.
" Carbolic	90

Ferri Sulphas (Monohydrate Sulph)	120
Ferrum sulfuricum pur. oxydat	40
Ferr. Succinic	60
Iron Tannate	S.M.
Ferr. Valerianic	S.M.
" Tartaric oxydat	S.M.
Iron Red oxide	V.S.M.
Ferri Sulphas Pulv. Sicc.	108
Ferr. Oxydat	V.S.M.
" Iodat	S.M.
" Phosphorat	V.S.M.
Ferri oxydul Nig	" "
Ferrum Malic	145
" Picronitric	60
" Salicylic	80
" oxydat. Hydrat	137
" Tannic	S.M.
Ferri Sulphas et Ammon	"
" Sesquichloid cryst.	120
" Phosphas U.S.P. (Ferric Phosphate)	95
Ferr. Phosphas lactic	60
" Phosphorus (oxydate)	54
" Sulpho-phenylic	S.M.
" Hypophosphoras	S.M.
" Pyrophosphoric	90
Ferri Sulphuret (Iron Sulphide)	S.M.

Blood Albumen 85 85
Ferrum Bromat S.M.
" Bromo-citric S.M.
" Arsenias 50
" Chlorat (muriatic oxydat) S.M.
Ferri-Ammon. Sulphas "
(Ammoniated Ferric
Ferro oxyanidum Lim 85
Ferri Ammon Citras (Scales) 90
Ferrum Bumic (in ch. recrystallz) 90
Ferri et Potass Tart. 125
(Tart Iron & Potass)
Chemic Iron Oxe S.M.
Ferrum Lactic (cryst crystal) S.M.
Ferro-morgan Citric 102
~~Ferrum Albuminatum~~
" Albuminat (Liquid) 125
" Acetic sacc 38
" Iodat U.S.M.
" Ammon chloride S.M.
Ferro-cyanokalium (ferrate) 55
Iron & Ammon - Potassio Pure U.S.M.
Ferr. Citras (Citrate of iron) 60
Ferrid-cyanokalium (ferrate) 105
Iron & Ammon Protosulph 70
Ferrum Hydro Reduct U.S.M.
Ferri et Ammon. Tartaras 65

Ferr. Iodat Alcohodirat U.S.M.
Iron Phosphate anhydrus 57
~~" Iodide~~
" Acetate ferric sice 42
" & Ammon Alum 140
" Phosphate 40
" Citrate & Ammonium 40
Ammon Uric 60
" Succinic cryp pur 18
Amidobenz (pulvd.) 17
Ammon Hypophosphorit 32
" Picrochromic (pure) 14
" Acetic 19
~~" Iodoform crook in~~
~~" Bromo~~ Picrametric 40
Iodide of Starch 23
Amidophenol (citrate) 28

Acid Alphanaphtoic 10
Ammon Tartarate 20
" Vanadinic 65
Sulphanilic Clustrad half finished.
Acid Acetine 14
Amidoazobenzol hydrochlorat 38

Amyl iodat.	25
Amidol oxalate	20
Guanidin carbonic. crystl.	25
Omidopropsinecaurs.	15
Ammon Phosphate	17
" Sulphate (pure)	30
" Sulphocyanide	27
" Sulphite	12
" Carbonas C.P.	17
" Citric	28
" Sulph.	35
" Chromic Nitrate	35
" Formicic	28
" Gallic (neutral)	30
" Bromid	15
" Salicylic cryst.	20
" Thiocyanate, Pure	85
" Sulphate (pure)	22
" Hydrate	20
" Phosphate	38
" Chloride	45
Cadmium Pure	30
Cadmium Carbonic	30
" Sulphate	43
Caesium Chlor	28

Oct 31st

Nitrate

" Nitrate

Iron & Ammon Perchloride.

Iron + ammon crystal || change plane strongly magnetic

when heated (dull strongly magnetic)

" Alkalinetic crystal (dull) D.M.&c

Mag. ring change class

When the solutions were poured

freely in a cylinder and suspended

in a cylinder of paraffin

was the cylinder set easily

a small rough) which measured

set powerfully) also change plane

Cobalt chloride showed same behavior

Cadmium Carbonic	42
" Sulpho-phenolic	23
Caffeine Benzoic Pure	40
Cadmium Acetic	20
" Nitric	27
Caffeine Sulphuric Pur cryst.	25
Cadmium Iodat	20
" Oxylat	27
Caffeine Valerianic Pur	45
" Arsenic	50
Cadmium Sulphuric	45
" Sulphurat	15
" Chlorat	28
" Bromat	25
Ammon. Bicarbic	20
" Arsenic cryst.	22
Natrium Arsenic Phosphor	17
Ammon. Bisulphuric	70
" Bichromate	15
" Boracic	27
" Gumme i gummi	S.M.
" Borate	25
" Arsenicos	S.M.
Carbo Animale pur humide	80
Ammonii Acetas Cryst. Pure	S.M.
Animal Charcoal	" "

1.55 ob. Pri. of alternative
2.20 " Lic. of alternative

As Prices of Tin (cast) shot & mass
" " " " shot & hammered " Bar & Mass

Malate Cadmium	S.M.
Bismuth Valerianic	32
" Citrate	22
" Sulfuric	65
" Tannic	20
Brucine Sulph	35
" Nitric	57
Butyl chloral hydrat	60
Borneol of Cinnamon ref.	60
Bismuth Lactic (unstable)	15
" Phenic "	S.M.
" Citric	30 each way
" Bromat	37 E 20 A ~~60~~
Barium Muriatic	175 or S.M.
Benzoin oxydat anhydr	25 ~~A~~ 32 E
" Carbonic	35 A 33 E
" Chlorat	27 A 32 E
" Fluorium Fluorat	42
" Sulfuric	28
Bismuth - Subgal (meta)	102. 25 A
" - Subsal (Subnit 7%)	105 E 55 A
" - " (pris)	30

Capsule Empty 15

Bismuth Nitrate basic 65 E

" Salicylate Basic 5.M

" Tannate 40 E 42 A

" Oxychloride 115

" Iodide 15

" Quinol-Iodide basic 90 E 85 A

~~Sto~~ Soda Bisulphate 40 E

Barium Hydrate Crude E 30 - 30 A

Manganese Oxide pure 70

Potassium Carbonate 65 E - 20 A

Ferri Quinine Citrate 115

Strychnine Bichloride 5-5

Nickel Chloride 75

Nickel Sulphate 28 E 42 A

" " 34 E

" " 47 E 7 A

Nov 6th 1918

Sod Bimat - Bismuth in Nitric Acid in solution of mag. citrate, cannot in 40 of added Hydrazine of Citric fmla.

Resistance varied no cause of Bismuth Nitrate in H_2SO_4 acid.

Bismuth Tannic in sol. in dil. H_2SO_4 Resistance capitals attended in ~~[illegible]~~ with direction fmaq.

Bismuth Nitric in Nitric Acid sol. - Increases but no since it may accounting to direction of mag. Appears to have 15 E in H

Bismuth Nitrate dissolved in H 8 with Acetic Acid no change observed in resis.

Nickel Sulphate in H_2O Plat. Electrodes no change.

Bismuth Tartrate Sol boiled in H. 8 + Acetic Acid Resistance 30000 ohms.

Oct 10 1873

Red Alternation 2.276 in per m.
6 Islands bells
1 are in field.
3 and in shaw circuit

Acetic Acid (Glacial) in pint tubes Rcs. (and not a mixture)

[illegible] Tartar Lit in dil H2SO4 [illegible] in no. due to [illegible] - Ent

Bismuth [illegible] NH4 HO precipitate
" Oxy[illegible] " " " "

(+) Bismuth Oxychloride in dil Nitric Acid
Rec for dest. 2.5 70 Thms. 1700 + 1000. May
[illegible] [illegible] [illegible] [illegible]
Bismuth Oxychloride in [illegible] Cit Sol

(+) Bismuth Oxychloride in dil Nitric Acid
in tubes in may field Rcs. [illegible]
with [illegible] [illegible] Thms X

Hard Rubber Sulp. S.M.
Stannous Chlorium 15
Sulphur Solium 17E 15A
P.Ferro. Ferrocyanide 45E 25A
Chromium Iodide 50
" Cyanide 40A 55E
Silver Cyanide 70E
" Chloride 42E
Cadmic Sulphide S.M.A S.M. E S.M.
Asphalt 60E
Kaolin 15A 13E Copey

Gum Guaiacum 100
" Sarsaparc 40
" Olibanum 23
" Tragacanthac S.M.
" Gelatin 35
" Galanut S.M.
" Benzoin (Vanilla) 35
" Kauri 35
" Asafoetida 95
" Amber 25
Kino 100
" Sagapenum 150
" Albumin (strained) D.M.S
eye S.M. Tak when hammered was slightly D.M.

Gum Ammonia 45
" Tamarak About 90
" Bonaire 35
" Damar 50
" Chicle S.M.
" Balata (purified) About 95
" Senegal 50
" Zanzibar fossil Amber 230 & 42
" Benzoin 50
" Mastic 30
" Euphorbium 20E 15A
Anime About 25
Bonair Aloes 10E 15
Zanzibar Copal 20E 10A
Opoponax (mitcham capsule) 50
Carbonized Aluminate of Nickel 100
(ammonia Sulphate)
Carbonate of Cadmium (nitrate) 70
Carbonized Aluminate Copper (sulphate) 25
" " Calcium (chl. ") 50
" " Cobalt (nitrate ") 20
" " Sodium (chl. ") 25
" " Tin (Bi Chl ") 35
" " Zinc (Sulphate ") 35
Carbonate Cerium 15E 15A
" Copper 25
" Mercury 45
" Zinc 40

Barium Hypophosphat anhydric techn. S.M.	
Ditain Pur	33
~~Iodin~~	
Elaterin Cryst. Merk.	35
Diphenyl.	30
Diphenylin	S.M.
Radix Trocken (not extracted)	60
Diphenylamin	55
Diaceton-aminopalate	15 C 10 A
Diacethylamin hydrochlorat.	150
~~Doch~~ Dichromat thiacen	35
Dinitrobenzol. Rohpl.	~~30~~ 20
" (Meta)	65
Daphnetin	35
Diphenin	50
Daturin pur. Cryst.	18
Diaethyl vanid	45
Dichrom azobenzol	70
Dialdin	30
Chlormet. Phenol (u. Chloroform Sol.)	43
Inulin pur.	65
Ammon Metallic	S.M.
Glycerinum Ammoniac	20
Dulcinol	40
Tuberculin Tolen	90
~~Oxyphenol extract~~	

Nitrophenol para.	35
~~Dinitrotoluol~~	
Nitrotoluol. crys. para.	35
Kali Phosphoricum.	30
Magnesia Tartaric	30
Magnes. Tartrat. pur.	13
" Silicic	23
" Oxydat	45
" Sulfo phenolic	15
" Sulphas (Sal Epsom)	15
" Sulfoxyd	125
" Sulfurit	45
Soda Carbonat C.P.	120
Ammon Nitr.	42
Magnesium Pur Metallic S.M.	
Natrum Phosphat	15
" Acet. Phosph.	28
Magnesia Hypo sulphurosa	25
Natrum Lactic	15
" Nitric	19
~~" Oxide Heavy Merck~~	
" Benzoic	18
" Borax	150
Magnesia Pur Carbonat	75
Magn. Boro-Citric.	35
Magnesia Bromide	19

Magnesia Hypo-sulphite	20
" Hypophosphite	32
" Carbon C.P. Cryst.	15
" Chloride	45
Magnesium Citricum	15
Soda Carbonate C.P. Anhydrous	15
" Hypo-sulphite	17
Glauber Salt	20
Muriatic	20
Molybdenum oxyd Pure	35
~~Morphia~~	
Morphia Acetate	85
" Sulphate Pure	60
Hydrum Hydrate Crude	85
Morphina Murias	40
Lithium Oxalic	30
" ~~Citric~~	
" Salicylic	27
" Benzoic	15
" Citric	35
" Boracic	37
" Sulfuric	20
" Bromide	20
" Carbon Pure	30
" Bi " Cryst	27
" Carbonic	25
" Phosphoric	25

Lithium Lactic	35
" Sulphuric	45
Calcium Sulpho-Carbol	27
" Lactic	25
" Lacto-Phosphoric	80
" ~~Iodide~~	
" Caustic C.P.	27
" Hypophosphite	42
" Phospho-Lactic (Solution)	55
" Propionic	15
" Hypo-chlorite C.P.	110
" Nitric Pure	15
" Oxalic	20
" Sulphuret	60 & 100 a
" Sulphas C.P.	27
" Phenylic Pure	25
" Phosphoric	30
" Phosphuret	~~135~~ 9.4
" Sulphurosum crude	
" Salicylic	60
" Saccharat	30
" Silicii	22
" Formas	55
" Formicic	33
" Fluoride	25
" Arsenicic	25
" Leontiten Saures	20

Aluminum Chl. Purus fund.		20
" Chromic		40
" Borocitrate	about	100
" Carbonic Purus		D.M.
Yohimbin		S.M.
Phenol Liquefactum		15
" Sulfuricum		20
" Iodatum	about	20
" Tannic Purus		20
" Fluoride		53
~~" Picrate~~	~~Apoj~~	
~~" Sulfonic~~		~~55~~ 55
~~Sulfonic~~		
" Lactic		15
" Formol		S.M.
" Permanganic		85
" Acetic Purus		20
" Ferrocyanat		22
" Nitric		25
Urosuccinamin		35
Tetraethyl Amon Iodat		20
Terpinhydrat		85

Menthol		40
Methylsyd Iodatus		D.M.
Mahonit		10
Narcein		25
Narcotin Purus		85
Naphtalamin		85
Naphtalin Bichromat		55
Naphtylamin hydrochlorat		15
Nucoleon (Wohlle gumm Eufortsching)		S.M.
Metanitro paratoluidin	Sol.	S.M.
Sulfo Carbamid		55
Valeralnatrium Benzolat		25
Veratrin Purus		20
Saccharin		
Succinimid methyl chloride		

(Filings from Magnet ... showing the supplied point)

... 8/10 '93

980 div. dia. of core.

... div. dia. " " at ... end.

1130 " " " " " other ".

1/4 distance from last end 1030 div. dia. core

1/2 " " " " 1000 " "

3/4 " " " " 1032 " "

Length of overall 2.2 cm. 2.2 of this core
Weight .073 grams.

.895 wt tube filled. 350
.051 " supply ... cross section core 350

380

7.20 " 990 / 940 1030 360

3.60 " 1040 / 1020 1010 366

967.5 / 1030 / 1020 / 07.5

361 = 0.01"

292 div. 292 / 292 / 283

.575

.851 276

1420 = 0.1 cm

1156 305

1422 276 / 1422 / 284

Dia of Glass tube 1800 div.

1720"

1810"

170

.1174 grams to support iron fillings.

Iron Mag wire;—

dia. .193 cm.

length 2.2 cm.

wt. .1183 grams

To support same ... dynes.

= 0.033 g to dislodge

5 pairs

$\frac{11}{14} \times 0.1 = ...$

24 ... dynes

Tube filled with soft iron filing

.377 Wt ~~of tube~~ to dislodge tube of iron filings

Dia of tube; {1515 + 329 {312 + 1510 (1/4) {1480 + 330 (1/2) {350 + 1500 (3/4)

" " iron core; {1240 {1258 {1255 {1270

end {360 + 1670 2030 Wt tube filled 0.090 g

{1400 1400 reduced to 0.045 g. supply 0.080

1844 1812 1810 1850

1280 1258 1255 1270

Soft Iron wire;—

Dia = .0635 cm. Length = 2.2 cm

Wt to dislodge 1.294 grams.

Wt .0535

Steel needle (... sewing needle) 2.2 .1057 cm dia

... 0.041 took 0.782 gm 820 div. dia.

Cast iron Sounding

Weight to displace 0.237

Weight of tube 0.045 End 1/4

Middle { 1260 + 1360 } { 1447 ± 160 } { 160 + 1450 } { 1390 ± 150 }
{ 1150 } { 1250 } { 1120 }

End { 1220 + 1420 } Rifle { 0.792 muff
{ 1140 } { 1945 } { 1960 } { 950
{ 1922 } { 1900 } { 925
{ 1000 } { 930

Length 2.2 over glass 2.1 mm

Cast iron bar 15.3 g. to displace

End

Dist 1245 1415

Length 2.28

Weight of iron shell from Hadfield's

U.S. Agt

tube half full 0.080 gms

Shot 0.215 × 0.780 = 0.16 cu cm

0.118 gms

$\frac{.00142}{0.16} = \frac{.00}{1.16} = 0.026 \times 0.118 = 0.0039$

tube filled 0.112 gms to displace

2.52 mm dl

2.25 bore

260	1280	1480	1020
	1020		1020
270	1300	1480	1050
	1020		975
			5070
295	1260	1450	1014
	975		
260	1310	1480	
	1050		
260	1255	1510	
	975	7400	
		1480	

1014 cor 1480 tube.

Mass of tube. 60 mm

Piece of sheet

Mass 2.998 g.

" " 995

" " 1012

" " 950

0.098 g. to displace

{diam 1.44.5 cross section}

0.885 cm × 0.215 cm

2.15 long

1005
950
1012
975
1002
1004

2.5

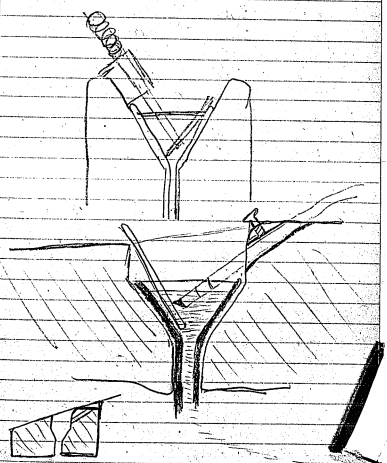
6

Tube of shaving collected under gauge

0.015 to displace

1610 inches for 2 2.2 long

119	7.1	1184	12000
116	6.78	1174	6500
113	6.20	1125	2070
109	5.90	1085	20570
106	5.57	1055	2070
103.2	5.26	1027	
100	4.92	995	
97	4.60	965	
94.5	4.30	940	
92.5	4.12	920	
90.3	3.9	898	
[illegible]	1.05	916	
83	3.25	826	
77	2.8	766	
70	2.25	697	
62	1.80	617	
55	1.4	548	
47	1.04	464	
41	0.75	408	
33	0.5	329	



~~Dia of tube~~

~~Tube~~

~~1640 ÷ 1720 cross section cock~~

Tube ~~under gas o line~~

cross-section of cock

1675 ÷ 1610

1mm = 1415 div.

Ca stick dry .018 grams.

Wt of tube filled = .060 grams.

Dia of tube 200 div microscopic

Length 1.4 cm cm.

1.46 cm. see adj.

Dia by micrometer .1438 cm.

.116 .01057 area 17.66 dynes

1671 dyne sq cm.

500 stick plate

On opening this tube, its contents tested ferrous.

Scraping from the lime sheet which have been exposed for 75 hrs tested ferrous but more nearly ferric showing presence of some oxygen

Tube from these scrapings 0.084 to dilution

dia of area average 500 div.

= 7.565 cm

area = .0020707 sq cm.

Mass = 33506

Brass soft wire (drawn)
L = 1/2 cm.
Wt = .014 grams
" to dislodge .99 grams
cross section = 8.45
current's strength 6.1 amperes

Brass soft wire 1 cm in length
Wt = .025
" to dislodge = .615 grams
dia = ~~.45~~ .850
current's strength 6.1 amperes

Brass bar ditto 1 1/2 cm long
Wt = .006 grams.
to dislodge = .777 grams
dia = .850 (1410 = 1mm)
Current 6.1 amp.

Ditto = 2 cm long
dia = .850 (1410 = 1mm)
Wt = .051 g
to dislodge = 1.179 "
Current 6.1 amp.

Ditto = 2 1/2 cm long
dia = .850 (1410 = 1mm)
Wt = .064 gr.
to dislodge = 1.412 "
Current = 6.1 amp

Ditto = 3 cm long
dia = .850 = (1410 = 1mm)
Wt = .075 g.
to dislodge = 1.5 g "
Current = 6.05 amp.

ditto 3 1/2 cm long
dia =
Wt =
to dislodge =
Cur =

6th Dec.

Telephone exp.

130 turns of steel

23 coils = 3376 w

119	7.5	1175
116	7.3	1145
1155	7.15	1141
112	6.8	1106
109	6.4	1076
106	5.95	1046
103	5.50	1017
98.5	4.95	972
96.5	4.75	953
94	4.5	928
92	4.3	908
89	4.0	879
87	3.85	859
85	3.65	839
77	2.95	760
74	2.50	740
65.2	2.10	644
54	1.50	533
49	1.25	484
44	1.06	434
38	0.85	375
0	0.28	

Dic 7th 1893 Carrington

Steel bar - cleaned with emerypaper
l = 1 cm
dia = 865 divisions (1405 = 1 mm)
wt = .024 grams
Displacing = .548 grams
Current = 6.1

Ditto
l = 1 1/2 cm
dia = 863 divisions
wt = .038 grams
Displacing = .819 grams (1405 = 1 mm)
Current = 6.1

Ditto
l = 2 cm.
dia = 865 divisions
wt = .05 grams.
Displacing = .991
Current = 6.05

Ditto
l = 2 1/2 cm
dia = 870 divs
wt = .06 gram
Displacing = 1.25 gm
Current = 6.1

Ditto
l = 3 cm
dia = 866 div.
wt = .073 gm
Displacing = 1.425 gr
Current = 6.1

Ditto
l = 3 1/2 cm
dia = 850 divs
wt = .085 gm
Displacing = 1.65
current = 6.1

(over)

Displ
l = 4 cm
dia = .843 dia
wt = .096
Displacing = 1.713 gm
current = 6.1

Dec 7th '93

Manganese Steel Wire cleaned in emery
l = 1 cm
dia = .1295 dia
wt = .0565 gm
Displacing = .0917 gm (about)

Manganese Steel Wire, emery cleaned
l = 1 cm
dia =
wt =
Displacing =
Current =

Mang. Steel Wire, emery cleaned
l = 1½ cm
dia =
wt =
Displacing =
Current =

Mang Steel Wire, emery cleaned
l = 2 cm
dia =
wt =
Displacing =
current =

Formerly weight = .039

Mang Steel Wire, emery cleaned
l = 2½ cm
dia =
wt =
Displacing =
current =

Mang Steel Wire, emery cleaned
l = 3 cm
dia = .1295 dia
wt = .161
Displacing = .040 gm
current = 6.1

Mang. Steel Mine, emery cleaned
lot 8/pcs
dia. 12.82
wt. .182
Displacing .047 gms
Curvature 6.1

Mang. Steel Mine, emery cleaned
lot 4
dia = 12.58
wt = ~~12.10~~ gm .210
Displacing = .037 gms
Curvature

Dec 8th 1893

Lute disc & cur 1.282 / 1.260
length =
wt = .088 grams
Displacing = ~~.037 gms~~ .018 grams
Curvat 6.1 aw

Length 1.65 — 1.9 over all

0.0871 0.000596 grams

3074

Dec 8th

1 Nickel Plate
.210 × .409 × 2.7
wt = 0.0992
Displacing 0.036 = 54.9 dr. 553

Mus Steel Plate
2 gon .217 × .644 × 2.7
wt = 1.98 0.1484
Displacing .045 g. 54.9 = 370

Dec. 11 1893.

Diameter of tube, 880 divisions
817 "
Varnish to 808
Thickest 887 "

Cat drain by measure for 1072 0.076 gm.
0.073 by measure

Weight to Dislodge 30.5 milligrams
Wt. of tube ~~880 mm~~ 29 milligrams
Length 2.2 in. 2.1 over core
Diam 0.05993 0.00282
29.9 dynes = 10610 dynes per cm
2.2 cm 1111

Dec. 12th

Max 1112
Min 1056

Mass L dislodge 0.070 gm

Dec 18, 1893.

Experiment on the magnetic pull of an iron wire from a laminated coil-core
Length 1/2'

Currents	Strength	Weight
1	ampere	
2	ampere	.134 grams
3	ampere	.258 grams
3 1/2	"	.465 "
4	"	
4 1/2	"	
5	"	
5 1/2	"	
6	"	
6 1/2	"	

$\frac{0.00125}{.005}$

$\frac{0.0125}{.365}$

	18400		0.00125
	20470		15.5 / 0.018
59.5 =	7.60	558	.75
53.5 =	5.85	529	5.75
50. =	5.10	495	5.0
47.5 =	4.59	470	4.49
45.5 =	4.1	450	4.0
42 =	3.5	415.5	3.4
39 =	3.05	386	2.95
36.5 =	2.6	361	2.5
33 =	2.23	326.5	2.15
28.5 =	1.7	282	1.6
27 =	1.1	227.5	1.00
	.17		

.042

0.255 cm = 0.37 " 0.04053 mm

$\frac{B}{\delta} = \frac{0.365 \times 10^3 \times 4.053 \times 10^{-2}}{.4708 \times 10^3} = 3.166 \times 10^{-4}$

15' 8"

= 31,660 1788 5.44 %

5.38 %

103	7.03	7.15	1020
102	6.95	7.0	1010
99	6.55	6.7	980
96.5	6.15	6.3	956
94	5.8	5.95	931
88	4.9	5.05	871
86	4.6	4.75	852
80.5	4.0	4.15	797
74.5	3.35	3.5	738
68	2.75	2.9	673
61	2.2	2.35	604
57	1.85	2.0	565
51	1.45	1.6	505
43.2	0.95	1.00	428
38	0.7	0.85	376
33	0.48	0.63	327
27	0.28	0.43	267
23	0.15	0.30	228
0	-0.15		

1st Test

11	6"	11½"	[illegible] sodium
	5½	10⅜"	
	½	½	1"
	4"	8⅞"	
	3½	4¾	
	½	1.5"	= ½"

with a blued sodium lamp

	3¼	4½	7¾
	8½	8¾	5¼
Quo	13¾	¾	2½
	5"	11"	16
	3½	8¾	12¼
	1½	2¼	3¾

163 30th Dec. 92

coated	3¾	8 ¾	12 ¾
10 am			
stripped	5	11½	16½

Test of current strength of lamps in series. (105 Volts)

current with	one lamp	—	.027
"	2 lamps	—	.017
"	3 "	—	.011
"	4 "	—	.0007
"	5 "	—	.0004
"	6 "	—	.00045
"	7 "	—	.0004
"	8 "	—	.00035

Memoranda of Books taken.

1. Dynamo electric machinery.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.
21.
22.
23.

$(a+ib)^2 = a^2 - b^2 + 2iab$

$1 + i^2 = 1 - 1 + 2i$

$= 2i$

$r(\cos\theta + i\sin\theta) = re^{i\theta}$

$r = e^{i}$

$e^{i\theta} \cdot e^{i\theta} = e^{(i+i)\theta}$

Oct 3 1st 1943

Trials of [illegible] in solution

Dyer Crystals (D.C) Trial Cond.

[illegible]

$$\frac{24.6331}{58} \times \frac{2.9}{3.1416} = 0.259$$

$$\frac{24.6331}{65.2636} = 0.3953$$

$$\int_0^{\pi} \sin^2 \phi = \frac{\pi}{2}$$

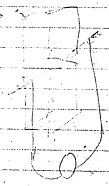
0.4

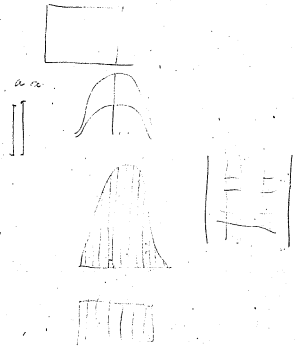
average ord. = 0.41 × 2 = 0.82.

20
2 | 6
7.4

2.2.5
20.5
2.

200
20
80
3.7
2.06
1.00
2.60





$\frac{nh}{n}$ = h

[ITEM FOUND IN BOOK]

Dear Mr Kennelly Jan 6/93.

In comparing this meter with the one belonging to the N.Y. office, please call this "A" and the other one "B."

Sincerely

E.W. Hammer.

DIVISION OF INSPECTION

EXTERNAL CORRESPONDENCE

EDISON GENERAL ELECTRIC COMPANY